



## Program description

# Electrical Engineering – Master - Sivilingeniør 3-year part-time online

120 ECTS/Online part-time with mandatory on-campus weeks at campus Narvik

Based on the document "Vilkår for bruk av tilleggsbetegnelsen Sivilingeniør (siv.ing.)" approved by The Norwegian Association of Higher Education Institutions spring 2023.

The programme description has been approved by the board of Faculty of Engineering Science and Technology on 24 September 2025

Valid from the academic year 2026/2028



|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Study programme name                                                              | <p>English: Electrical Engineering - Master</p> <p>Bokmål: Elektroteknikk, sivilingeniør - master</p> <p>Nynorsk: Elektroteknikk, sivilingeniør - master</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Degree obtained                                                                   | <p>Master of Science in Electrical Engineering</p> <p>Master i Teknologi/sivilingeniør, Elektroteknikk</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Target group                                                                      | The Master Program in Electrical Engineering is suitable for students with an interest in power systems and electric energy sources, energy storage and conversion, as well as advanced electric motor drives.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Admission requirements, required prerequisite, recommended prerequisite knowledge | <p>A relevant undergraduate Bachelor degree in Engineering programme in power electronics, electrical machines or power systems.</p> <p>In addition, the following requirements must be met:</p> <ul style="list-style-type: none"> <li>• minimum 25 ECTS in mathematics (equivalent to Mathematical Methods 1, 2 og 3)</li> <li>• 5 ECTS in statistics</li> <li>• 7,5 ECTS i physics on a higher level is required.</li> </ul> <p>The requirement for physics can be covered by 7.5 ECTS in physics, building physics, fluid mechanics, thermodynamics and/or mechanics of materials.</p> <p><b>For Norwegian/Nordic applicants:</b><br/>If you do not have enough mathematics and/or physics to qualify for a master's degree in technology, you can take one of these courses in the first semester at UiT in Narvik: TEK-2800 Mathematics 3 (5 ECTS) and/or TEK-2801 Physics 2 (5 ECTS)</p> |
| Certificate of good conduct                                                       | Not required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Suitability assessment                                                            | Not required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| The study programme's Learning Outcome                                            | <p>After completing the study program, the candidate has the following learning outcome:</p> <p><b>Knowledge:</b></p> <ul style="list-style-type: none"> <li>• has knowledge of the principles of electromagnetism and its application in electrical engineering.</li> <li>• knows the principles of electric power system.</li> <li>• has a knowledge of energy conversion using power electronics. and applications to electrical machines and power supplies.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                     |

- has knowledge of measurement sensors, signal processing, and how these could be integrated in an advanced control system.
- has basic knowledge of computer architecture and programming.
- has basic knowledge about economics and innovation, with special focus on idea development.
- has a deep understanding in one or more of the following topics:
  - operation and control of power systems
  - integration of renewable energy and smart grids.
  - stability of power systems
  - thorough knowledge of electrical machines, their dynamics and choice of suitable power electronic converter types for motor drives.
  - programmable controllers and logic systems
  - design and production electronic solutions

**Skills:**

- can use linear algebra and numerical methods as mathematical tools for analysing physical processes and technical solutions.
- can combine power electronics, control engineering and electrical systems into advanced electric motor drives.
- can perform simulations and analysis of electric power systems.
- can analyse electromagnetic fields in electric systems.
- can complete and document a larger independent research work in the form of a master thesis.
- can perform one or more of the following skills:
  - stability analysis of power systems
  - integration of distributed renewable energy into the grid
  - can design and prototype electric circuits.
  - can use programmable microelectronics in order to control and monitor mechatronics, electric systems, electric devices, and industrial processes.

**General competence:**

- gains insight into new and innovative technologies and will be able to put these into an interdisciplinary society and ethical perspective.
- gains insight into various aspects of future network systems, energy solutions and sustainability challenges.

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | <ul style="list-style-type: none"> <li>• can disseminate knowledge in oral and written form to professionals and non-specialists.</li> <li>• is able to see the combination of physical energy systems and software in cyber-physical systems and mechatronics.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Academic content and description of the study programme | <p>The master's program covers essential and advanced skills within electric energy conversion, electric drives, control methods and power systems for electrical engineers working with the technology for the future. These technologies are critical for the electrification and digitalisation of our society, an important element towards a sustainable future. Important applications are renewable energy generation, energy storage, energy distribution, and electric transport including electric vehicles, ships, and aircrafts.</p> <p>Advanced skills are supported by fundamental knowledge given within electromagnetism, power electronics, programming, power systems, control engineering, measurement system, signal transmission and mathematics.</p> <p>In the third and fifth semester, the student can choose to specialise by their choice of electric courses, or exchange to another institution provided that external courses are similar in content and scope to those specified in this program description.</p> <p>See additional information and an overview of mandatory tasks in the individual course descriptions.</p> <p>The study program is a part-time study over three years, organised as an online study with mandatory on-campus weeks.</p> <p>The Master in Electrical Engineering is founded on the "conditions for use of the protected title Sivilingeniør" according to "Nasjonale retningslinjer for ingeniørutdanning" by "Universitets- og høyskolerådet".</p> |

Table: Programme structure over three years

| Semester | 5 ECTS                       | 5 ECTS                           | 5 ECTS                           | 5 ECTS | 5 ECTS                                | 5 ECTS                                                    |
|----------|------------------------------|----------------------------------|----------------------------------|--------|---------------------------------------|-----------------------------------------------------------|
| 1        | MAT-3800<br>Linear algebra 2 | MAT-3801<br>Numerical<br>Methods | ELE-3606<br>Control Engineering  |        | ELE-3611<br>Programming               | ELE-3613<br>Electromagnetic<br>analysis in<br>engineering |
| 2        |                              |                                  | ELE-3607<br>Power<br>Electronics |        | ELE-3600 Power System<br>Fundamentals |                                                           |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                         |  |  |                                                        |                                         |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--|--|--------------------------------------------------------|-----------------------------------------|
| 3 | Elective courses (choose minimum 15 ECTS).<br><br>Forhåndsgodkjente valgmenner:<br>ELE-3602: Power System Operation and Control (5 ECTS)<br>ELE-3603: Programmable circuits (5 ECTS)<br>ELE-3604: Distributed Power Generation into an Electric Power Network (5 ECTS)<br>ELE-3608: Advanced Electric Drives (5 ECTS)<br>ELE-3610: Power System Stability (5 ECTS)<br>ELE-3614: Advanced PLC programming (5 ECTS)                                                                                                                                  |                                                         |  |  |                                                        |                                         |
| 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ELE-3612<br>Instrumentation<br>and measuring<br>systems |  |  | ELE-3609<br>Signal<br>Distribution and<br>Transmission | TEK-3501<br>Innovation and<br>economics |
| 5 | Elective courses (choose minimum 15 ECTS).<br><br>Forhåndsgodkjente valgmenner:<br>ELE-3601: Renewable Energy Generation and Conversion (5 ECTS)<br>ELE-3602: Power System Operation and Control (5 ECTS)<br>ELE-3603: Programmable circuits (5 ECTS)<br>ELE-3604: Distributed Power Generation into an Electric Power Network (5 ECTS)<br>ELE-3605: Electrical Circuit Design and Prototyping (5 ECTS)<br>ELE-3608: Advanced Electric Drives (5 ECTS)<br>ELE-3610: Power System Stability (5 ECTS)<br>ELE-3614: Advanced PLC programming (5 ECTS) |                                                         |  |  |                                                        | ELE-3615<br>Scientific<br>Writing       |
| 6 | ELE-3900<br>Master Thesis – M-EL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                         |  |  |                                                        |                                         |

The first and sixth semester is run as full-time semesters, while semester 2-5 is run as 50 % of full-time. It is recommended that the master thesis in the sixth semester is made in cooperation with the industry, for example your own employer.

In semester 3 and 4, the student must choose at least 15 ECTS electric courses, or exchange to another institution with a similar field of study. It is also possible exchange to another institution for completing the master thesis at the sixth and final semester.

Elective courses can require a minimum number for attending students for being run. This will be informed to the students prior to the selection of courses. Elective courses outside the pre-approved list must have relevance for the master's programme and be approved by the academic programme manager.

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Learning activities,<br>examination and assessment | <p>Most courses are based on lectures, self-study and assignments or small projects, individually or in groups. Each 5 ECTS course usually includes 40 lectures, plus supervision time. The handouts can be voluntary or mandatory.</p> <p>Mandatory lab exercises are included in some topics, where activities that requires physical presence will be organized in mandatory on-campus weeks. Scientific theory, application and analysis is emphasized in assignments and projects. The individual course descriptions provide additional information.</p> <p>The study offers a learning foundation where digital tools and online support resources are widely used. Learning resources of each subject are available in an LMS (Learning Management System). Most of the subject information is gathered there, such as lecture notes, assignments, tests, links, deadlines, etc., and it</p> |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                          | <p>is also a platform for the main communication with lecturers and fellow students.</p> <p>Teaching can take place in different ways depending on the course. Traditional lecture model is primarily used and adapted to flipped classroom teaching, while some courses has implemented projects and other types of active teaching methods.</p> <p>In an online study program, the student will have a great deal of freedom in working with the various subjects. Some exercises can be completed online, while others require physical attendance during on-campus weeks. These are typically assignments that use equipment that is only available in our laboratories. The lecturer and any scientific assistants will be available digitally, as well as physically present during on-campus weeks.</p> |
| The study programme's relevance                          | <p>With a master's degree in electrical engineering, you can work within all types of use and control of electricity, including development, design and construction, research, environmental surveillance, data technology, electrical supply and instrumentation.</p> <p>With a growing focus on the development of sustainable and renewable energy production, electric energy will play a key role in many new energy-intensive areas of our society. We see it in transport, on land, sea and in the air as an exciting development area. The electrical engineer will play a central role in the renewable energy community of the future.</p>                                                                                                                                                          |
| Work scope                                               | <p>The annual scope of work should be 1500 work hours for 100% full-time studies. In order to achieve the learning objectives, the students are expected to work on average 40 hours per week in full time studies, including lectures, lab exercises and self-study. For semester 2-5 at 50 % part-time, the expected average is 20 hours a week.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| For master's theses/independent work in master's degrees | <p>The master thesis cover the entire final semester and has a scope of 30 ECTS. The work will be evaluated based on the written report with grades A – F. The thesis should be written and submitted individually, but it is possible to cooperate with other students working on difference aspects of the same problem.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Language of instruction and examination                  | <p>English</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Internationalisation                                     | <p>The study program is primarily targeting Nordic candidates but is open to international students that can participate on the mandatory on-campus weeks. The department is participating in international research projects, which influences subject contents and diploma projects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Student exchange                                         | <p>It is possible to study parts of the master program at other universities. An individual plan must in this case be made in accordance with the academic programme director.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                                           |                                                                                                                                                                                     |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supervised professional training                          | Supervised professional training in the industry is encouraged, but not required for completing the programme.                                                                      |
| Administrative responsibility and academic responsibility | Academic programme director: Bjarte Hoff<br>Head of Department of Electrical Engineering: Arild Steen<br>Faculty of Engineering Science and Technology, Dean Bjørn Reidar Sørensen. |
| Quality assurance                                         | Annual subject evaluation reports and study program evaluation reports.<br>Periodic evaluation of the study program every six years.                                                |
| Other regulations                                         |                                                                                                                                                                                     |

